

WHAT IS CLAIMED IS:

1. A method of operating a nuclear reactor, in which a boiling water reactor is operated while a pH of reactor water in said reactor is controlled on an alkali side and hydrogen is injected in said reactor water, characterized in that:

a pH at room temperature of said reactor water is controlled at a relatively high level in a range of  $8.5 < \text{pH} \leq 9$  at the beginning stage of start-up operation of one operating cycle, and then controlled at a relatively low level in a range of  $7 < \text{pH} \leq 8.5$  until shutdown operation; and

a hydrogen concentration of said reactor water is controlled in a range of 30 to 100 ppb throughout said operating cycle.

2. A method of operating a nuclear reactor, in which a boiling water reactor is operated while a pH of reactor water in said reactor is controlled on an alkali side and hydrogen is injected in said reactor water, characterized in that:

a pH at room temperature of said reactor water is controlled at a relatively high level in a range of  $8.5 < \text{pH} \leq 9$  at the beginning stage of start-up operation of one operating cycle, and then controlled at a relatively low level in a range of  $7 < \text{pH} \leq 8.5$  until shutdown operation; and

a hydrogen concentration of said reactor water is controlled in a range of 30 to 100 ppb in most of said operating cycle excluding a short period upon rated operation, and is increased to a value in a range of 100 to 200 ppb in said short period upon rated operation.

3. A method of operating a nuclear reactor according to claim 1 or 2, wherein the pH at room temperature of said reactor water is reduced from said high level to said low level in a period in which the temperature of said reactor water is lower than that upon rated operation.

4. A method of operating a nuclear reactor according to any one of claims 1 to 3, wherein the pH at room temperature of said reactor water is controlled at said high level by injecting, a solution or gas which indicates alkalinity when being dissolved in water, in a reactor primary cooling system.

5. A method of operating a nuclear reactor, in which a boiling water reactor is operated while a pH of reactor water in said reactor is controlled on an alkali side and hydrogen is injected in said reactor water, characterized in that:

a pH at room temperature of said reactor water is controlled in a range of  $7 < \text{pH} \leq 8.5$  throughout one operating cycle; and

a hydrogen concentration of said reactor water is controlled in a range of 30 to 100 ppb in most of said operating cycle excluding a short period upon rated operation, and is increased to a value in a range of 100 to 200 ppb in said short period upon rated operation.

6. A method of operating a nuclear reactor according to any one of claims 1 to 5, wherein an alkali-type cation resin is used for a demineralizer in a condensate system or a reactor water clean up system, and the pH at room temperature of said reactor water is controlled in the range of  $7 < \text{pH} \leq 8.5$  by adjusting a concentration of cations leaked from said cation resin.

7. A method of operating a nuclear reactor according to any one of claims 1 to 6, wherein the hydrogen concentration controlled in the range of 30 to 100 ppb is controlled in a range of 30 to 65 ppb.

8. A method of operating a nuclear reactor according to claim 2 or 5, wherein the hydrogen concentration of said reactor water is increased when a crack growth rate monitored by a crack growth rate sensor provided in said reactor water or a sampling pipe line connected thereto becomes larger than a specific value.

9. A method of operating a nuclear reactor, in which a boiling water reactor is operated while a pH of reactor water in said reactor is controlled on an alkali side and hydrogen is injected in said reactor water, characterized in that:

a pH at room temperature of said reactor water is controlled at a relatively high level in a range of  $7 < \text{pH} \leq 9$  at the beginning stage of start-up operation of one operating cycle, and then controlled at a relatively low level in said range until shutdown operation; and

a hydrogen concentration of said reactor water is controlled in a range of 30 to 100 ppb throughout said operating cycle.

10. A method of operating a nuclear reactor, in which a boiling water reactor is operated while a pH of reactor water in said reactor is controlled on an alkali side and hydrogen is injected in said reactor water, characterized in that:

a pH at room temperature of said reactor water is controlled at a relatively high level in a range of  $7 < \text{pH} \leq 9$  at the beginning stage of start-up operation of one operating cycle, and then controlled at a relatively low

level in said range until shutdown operation; and

a hydrogen concentration of said reactor water is controlled in a range of 30 to 100 ppb in most of said operating cycle excluding a short period upon rated operation, and is increased to a value in a range of 100 to 200 ppb in said short period upon rated operation.